CLAIMS

1. A method for controlling a sound field reproduction unit (2) comprising a plurality of reproduction elements (3_n) using a plurality of sound data input signals (SI) each associated with a predetermined general reproduction direction defined relative to a given point (5) in space, in order to obtain a reproduced sound field of specific characteristics that are substantially independent of the intrinsic reproduction characteristics of the unit (2), characterized in that it comprises:

- a step (10) for determining at least spatial characteristics of the reproduction unit (2), permitting the determination of parameters that are representative, in the case of at least one element (3_n) of the reproduction unit (2), of its position in the three spatial dimensions relative to the given point (5);

- a step (50) for determining adaptation filters (A) using the at least spatial characteristics of the reproduction unit (2) and the predetermined general reproduction directions associated with the plurality of sound data input signals (SI);

- a step (70) for determining at least one signal for controlling the elements of the reproduction unit by applying the adaptation filters to the plurality of sound data input signals (SI); and

- a step for providing the at least one control signal with a view to application to the reproduction elements (3_n).

2. A method according to claim 1, characterized in that step (10) for determining at least spatial characteristics of the reproduction unit (2) comprises an acquisition sub-step (20) enabling all or some of the characteristics of the reproduction unit (2) to be determined.

3. A method according to either claim 1 or claim 2, characterized in that the step (10) for determining at least spatial characteristics of the reproduction unit (2) comprises a calibration step (30) enabling all or some of the characteristics of the reproduction unit (2) to be provided.

4. A method according to claim 3, characterized in that the calibration sub-step (30) comprises, in the case of at least one of the reproduction elements (3_n) :

- a sub-step (32) for transmitting a specific signal ($u_n(t)$) to the at least one element (3_n) of the reproduction unit (2);

- a sub-step (34) for acquiring the sound wave emitted in response by the at least one element (3_n);

- a sub-step (36) for converting the acquired signals into a finite number of coefficients representative of the emitted sound wave; and

- a sub-step (39) for determining spatial and/or sound parameters of the element (3_n) on the basis of the coefficients representative of the emitted sound wave.

5. A method according to either claim 3 or claim 4, characterized in that the calibration sub-step (30) also comprises a sub-step for determining the position in at least one of the three spatial dimensions of the at least one element (3_n) of the reproduction unit (2).

6. A method according to any one of claims 3 to 5, characterized in that the calibration step (30) comprises a sub-step for determining the frequency response ($H_n(f)$) of the at least one element (3_n) of the reproduction unit (2).

7. A method according to any one of claims 1 to 6, characterized in that step (50) for determining adaptation filters comprises:

- a sub-step (54) for determining a decoding matrix (D) representative of filters permitting compensation for the changes in reproduction caused by the spatial characteristics of the reproduction unit (2);

- a sub-step (55) for determining an ideal multi-channel radiation matrix (S) representative of the predetermined general directions associated with each data signal of the plurality of input signals (SI); and

- a sub-step (56) for determining a matrix (A) representative of the adaptation filters using the decoding matrix (D) and the multi-channel radiation matrix (S).

8. A method according to claim 7, characterized in that the step (50) for determining adaptation filters comprises a plurality of calculation sub-steps (51, 52, 53) permitting the provision of a limit order (L) of the spatial precision of the adaptation filters, a matrix (W) corresponding to a spatial window representative of the distribution in space of the desired precision during the reconstruction of the sound field, and a matrix (M) representative of the radiation of the reproduction unit (2), the sub-step (54) for calculating the decoding matrix (D) being carried out using the results of these calculation sub-steps.

9. A method according to either claim 7 or claim 8, characterized in that the matrices for decoding (D), ideal multi-channel radiation (S) and adaptation (A) are independent of the frequency, step (70) for determining at least one signal for controlling the elements of the reproduction unit by applying the adaptation filters corresponding to simple linear combinations followed by a delay.

10. A method according to any one of claims 1 to 9, characterized in that the step (10) for determining characteristics of the reproduction unit (2) permits the determination of sound characteristics of the reproduction unit (2) and in that the method comprises a step (60) for determining filters for compensating for these sound characteristics, the step (70) for determining at least one control signal then comprising a sub-step (90) for applying the sound compensation filters.

11. A method according to claim 10, characterized in that the step (10) for determining sound characteristics is suitable for providing parameters representative, in the case of at least one element (3_n), of its frequency response ($H_n(f)$).

12. A method according to any one of claims 1 to 11, characterized in that the step (70) for determining at least one control signal comprises a sub-step for adjusting the gain and applying delays in order to align temporally the wavefront of the reproduction elements (3_n) as a function of their distance from the given point (5).

13. A computer program comprising program code instructions for performing the steps of the method according to any one of claims 1 to 12 when the program is performed by a computer.

14. A removable medium of the type comprising at least one processor and a non-volatile memory element, characterized in that the memory comprises a program comprising code instructions for performing the steps of the method according to any one of claims 1 to 12, when the processor performs the program.

15. A device for controlling a sound field reproduction unit (2) comprising a plurality of reproduction elements (3_n), comprising input means (112) for a plurality of sound data input signals (SI) each associated with a

predetermined general reproduction direction defined relative to a given point (5), characterized in that it also comprises:

- means (116) for determining at least spatial characteristics of the reproduction unit (2), permitting the determination of parameters that are representative, in the case of at least one element (3_n) of the reproduction unit (2), of its position in the three spatial dimensions relative to the given point (5);

- means (114) for determining adaptation filters (A) using the at least spatial characteristics of the reproduction unit (2) and predetermined general reproduction directions associated with the plurality of sound data input signals (SI) ; and

- means (114) for determining at least one signal (sc_n) for controlling the elements (3_n) of the reproduction unit (2) by applying the adaptation filters (A) to the plurality of sound data input signals (SI).

16. A device according to claim 15, characterized in that the means for determining the at least spatial characteristics of the reproduction unit (2) comprise means (116) for the direct acquisition of the characteristics.

17. A device according to either claim 15 or claim 16, characterized in that it is suitable for being associated with calibration means (91, 92, 93, 100) permitting the determination of the at least spatial characteristics of the reproduction unit (2).

18. A device according to claim 17, characterized in that the calibration means comprise means (100) for acquiring a sound wave which comprise four pressure sensors arranged in accordance with a general tetrahedral shape.

19. A device according to any one of claims 15 to 18, characterized in that the means for determining characteristics are suitable for determining sound characteristics of at least one of the elements (3_n) of the reproduction unit (2), the device comprising means for determining sound compensation filters using the sound characteristics, and the means for determining at least one control signal being suitable for the application of the sound compensation filters.

20. A device according to claim 19, characterized in that the means for determining the sound characteristics are suitable for determining the frequency response ($H_n(f)$) of the elements (3_n) of the reproduction unit (2).

21. An apparatus for processing audio and video data, comprising means (112) for determining a plurality of sound data input signals (SI) each

associated with a predetermined general reproduction direction defined by a given point (5), characterized in that it also comprises a device for controlling a reproduction unit (2) according to any one of claims 1 to 19.

22. An apparatus according to claim 21, characterized in that the means for determining a plurality of input signals are formed by a unit (112) for reading and decoding digital audio and/or video discs.